such as browsing Internet or using a network computer without being restricted to his/her desk. By moving user's thumb on the touchpad located on the handheld unit, a user can either move mouse cursor or write on the touchpad to simulate keyboard inputs. Keyboard input simulation is accomplished by a recognition component embedded in the hookup software that traces user's thumb movements and interprets them.

CLAIMS

What is claimed is:

1. A computer mouse for manipulating by the right hand of a user to control the operation of a computer comprising:

   a). mouse body fit into the palm of a user's right hand;

   b). a mouse movement tracking mechanism , having a pressure sensitive touchpad occupying a portion of the mouse body, for producing contact data regarding the location information of user's thumb on the touch as mouse input signals, said touchpad being able to simulate keyboard inputs when a user touches on the touchpad surface by right thumb;

   c). its associated hookup software, the said software residing on a user's computer connected with the said touchpad, being able to recognize mouse movements as keyboard input signals, based solely on mouse input signals;

2. The handheld unit of Claim 1 further comprising

   a). a touchpad,

   b). mouse buttons,

   c). an optional holder to house the said mouse body when the said mouse is not handheld;

3. The handheld unit of Claim 1 being small enough to be hold comfortably in an operator's right hand in grasping grip;

4. The handheld unit of Claim 1 being of elliptic shape (Figure 1) with buttons located on the front of the said touchpad and/or on the side of the said touchpad, easily and comfortably locatable by other fingers of the user's same hand in grasping grip position;

5. The handheld unit of Claim 1 being credit card shape, with buttons located on the front of the said touchpad and/or on the side of the said touchpad, easily and comfortably locatable by other fingers of the user's same hand in grasping grip position;

6. The handheld unit of Claim 1 being able to be ergonomically operated solely by the user's right hand alone to input both mouse and keyboard information, with no need of user's eye focus on the said touchpad, thus being able to operate in the dark where the user being able to hold mouse while not being able to focus his eye sight on the said touchpad or mouse at all;

7. The handheld unit of Claim 1 wherein the said unit is connected to computer through regular cable; RF signals, IR signal and blue tooth technology;

8. The method that the said associated hookup software working as an interpreter between the said touchpad input signals and the computer operating system allows a user's thumb movement being recognized as either regular mouse signals or keystroke signals, with no additional need of any hardware except the said touchpad mouse, with no additional information except the mouse signal generated by the said touchpad;.

9. The method that the hookup software processing handwriting stroke's information without the need of gaining absolute locations of thumb movement signals generated from the said touchpad; using only traditional mouse information containing only relative movement signals;

10. The method that the additional part of the mouse, the base holder unit, is separated from the core moveable part, the handheld unit, allowing the flexibility of being used as handheld or as a regular touchpad mouse.

DESCRIPTION

1. FIELD OF THE INVETNION

The present invention relates to a pointing device used in conjunction with a personal computer. Particularly this present invention relates to a pointing device that is conventionally referred to as a mouse.

2. BACKGROUND OF THE INVENTION

Computers are usually equipped to use a mouse for controlling the movement of its cursor. Computer mice employ mechanical, optical or other means to control the displacement of a cursor on a computer screen. By moving the mouse across a flat surface along two axes, the cursor is proportionally moved across the computer screen. Computer mice have been an inseparable part of personal computers and have been in wide use since its inception. However, it has also been reported that extended or repeated use of the mouse can result in severe physical strain. This physical strain develops because, for the hand, even the smallest of postural shifts can increase or decrease stresses on the hand and fingers. The reported number of mouse over-use related injuries is increasing and in some industries the injury rates rival and even surpass those of keyboard related injuries. These injuries are collectively referred to as repetitive stress injuries (RSI).

As also quoted in U. S. Patent No. 6,005,553, some of the stress is caused by

1. Restriction of the movement of the index finger to the left button, which necessitates pronation of the entire forearm to accomplish.

2. Restriction of the movement by the fingers and a limitation on the range of fine control. This necessitates a shift of movement activation from the fingers to the wrist and shoulder.

3. The right button position on conventional mice doesn't allow alternative grip positions with the ring finger thereby exacerbating the strain imposed on all fingers.

Using a traditional trackball mouse is advantageous in some situations. For example, in the case of graphical design or programming, a user would demand its mouse to have a high pointing precision. On the other side, growing number of today's computers, including network computers have been extensively used to browse Internet. During browsing, a user has to frequently follow hyperlinks. By clicking the mouse on the area of a hyperlink, the user will be able to retrieve and view further information indicated by the hyperlink. Performing the task of browsing Internet by following

hyperlinks does not require a mouse to have as high point precision as in the case of some other applications. In the graphical design applications for example, it sometimes requires a user to point the cursor on an area as small as a character. However, following hyperlinks only requires a user to place cursor over an area, usually a text string, or a button, or a picture. Ideally, the user would have sit in a repose position viewing the computer screen as watching a TV set since browsing Internet is very viewing intensive. Using a regular trackball mouse on the mouse pad or a touchpad mouse that fixed on the keyboard requires the user to move the user's a arm and fingers. As mentioned earlier, it could cause excessive strain on both a user's arm and hand and figures. It is thus not ergonomically justifiable.

There have been many attempts to relieve the stress of users from using a traditional trackball mouse and touchpad mouse. However, almost all the efforts are focused on modifications of mice shapes. U.S. Patent No. 6,005,553 is one of such an example where a mouse is designed with palm knobs and enlarged square ends.

There is another point device that is closely related to the traditional trackball mouse. It is the touchpad device. Touchpads are small digitizer based devices to allow a person to write or draw upon its surface to generate codes and signals by its controller. The signals and codes are then to be interpreted by a computer system. One application of touchpads is to simulate a computer mouse. There are physical and mechanic differences between touchpad and traditional trackball mouse. For example, touchpad input are recorded in absolute position while a standard mouse such as a MICROSOFT mouse or IBM PS/2 mouse provide only relative location of cursor on a display screen, that is, all its movement is relative to the current position of the cursor. Thus, for a touchpad to simulate standard mouse input, a internal mouse emulation program usually are needed (US patent 5,995,084).

An advantage of touchpad over the traditional trackball mouse, however, is that the touchpad can be a "writing surface" for capturing the position of a finger, pen or stylus upon the touchpad. The touchpad signals are analog signals that will be captured by the touchpad controller and translated to digital codes. The digital codes will then be transferred to a computer system through an interface. The interface may be an industry standard serial interface, an industry standard parallel interface, or a custom interface requiring special adapter circuitry within the computer system. Touchpads have applications to mobile, portable, or laptop computing systems. Touchpads have also been used as a remote control when its surface is divided into sub regions to simulate button inputs (US patent

5,990,890). Touchpads have also been used as tools for primary human input interface. Handwritings on touchpads are interpreted to text and drawings to create commands and data to operate some personal digital assistant. The pressure of the pen or stylus upon the touchpad and whether the pen is in contact with the touchpad are used to determine formations of characters.

However, to applicant's knowledge, touchpad mice in most cases are physically unmovable and attached to the computers. Thus the applications does not fundamentally remove the source of the strain that causes the physical stress on figures, arms and shoulder, as explained earlier. However, there are some exceptions.
U. S. Pat. No. 5,990,890 disclosed a touchpad can be used as a remote control devices to control TV sets, or entertainment devices.

U.S. Pat. No. 6,219,037 (Lee) discloses a pointing device provided with two types of input means for a computer system, preferably a notebook (or portable) computer. This is accomplished by making the mouse removable from the portable computer. Since most mice attached to portable computers are fixedly mounted to the housing of the portable computer system, making the mouse removable from the portable computer provides a user the choice of using either track ball type mouse or touchpad mouse. The touchpad mouse when it is detached from the portable computer can also be used wirelessly when handheld. However, the touchpad or trackball mouse when handheld, is neither ergonomic nor is it capable perform keyboard functions. A handheld mouse, if unable to perform keyboard function, is ergonomically disadvantageous. A user would either have to hand held both a keyboard and a mouse to perform most necessary functions to communicate with computers.

In a similar endeavor, U.S. Pat. No. 6,035,350 (Swamy, et al.) discloses a detachable I/O device with built-in RF/IR functionality to facilitate remote audio-visual presentations. The circuitry design is disclosed to incorporate the detachable I/O device into the system. No specific restriction is imposed on the type of the device. Track pad and trackball mouse are mentioned as examples. The design, has the same shortcoming as U.S. Pat. No. 6,219,037 (Lee). Specifically, (1) significant modification or special circuitry is required to incorporate the design into the system; (2) Multiple input/output devices are needed to communicate and control the computer effectively and ergonomically, especially when handheld.

Thus, it is the subject of this invention to provide light, handheld, ergonomically shaped computer mouse that totally alleviate the need that the operator have to be restrained to the desk when performing navigating oriented tasks. The invention comprises an ergonomically shaped mouse and the method to devise the process to allow the mouse simulate keyboard entries to totally so to accomplish the task of navigating oriented task For example, the user can sit any relax position where computer monitor is visible. Holding the handheld mouse brewing Internet web site, when needed, entering information such as login in web site Identifiers, name, password right from the same mouse just using his/her thumb. All this overcomes the shortcomings of the traditional trackball mouse and regular touchpad attached to the computer that causes the strains on user's shoulder, arm and figures.

The new ergonomic mouse allows a user's right thumb movement to be recognized as keyboard entries. The same method disclosed also allows the thumb movement on all commercially available touchpads to be interpreted as key entry signals without revising the design of the touchpad and its device controller. The software adopting the principle of the disclosed method resides on the computer systems. The software is called mouse hookup software. It intercepts touchpad movement signals to determine the modes between mouse input and keyboard input.

When pointing precision is required, simulations of traditional trackball mice can be achieved by placing the handheld mouse in its base holder. The holder then forms the base for the handheld mouse. The mouse then will function as a traditional touchpad mouse except that it will also accept handwritings as keyboard entries. To summarize, the invention replaces both keyboard and traditional mouse for any transitional personal computer, which usually requires keyboard, and a mouse to accomplish the functions of inputs. The replacement is ergonomically justified when used in browsing oriented tasks such as browsing Internet.

3. DESCRIPTION OF RELATED ARTS

U.S. Pat. No. 4,812,828 (Nishi, et al.) discloses a video display processor that is connected to a mouse or a light pen. A special processor is needed to place the pulse signals. The processor will clock the X and Y counters and processes them depending on the modes of the inputs (in mouse mode and light pen mode).

U.S. Pat. No. 5,805,144 (Scholder, et al.) discloses a pointing device and a method of providing movement data and position data with a mouse pointing device. The device combines a traditional mouse with a touchpad. With the traditional mouse providing movement information, the touchpad supplies additional information about possible positional data demanded by some applications to simulate analog-type commands. These commands are sometimes useful in graphic art design, multimedia and games, on-screen virtual slide-bars and virtual potentiometer-type control. These commands, even though can be executed already using the traditional mousse, might be accomplished more easily and ergonomically using the touchpad. The touchpad function thus is used to supplement the functions of traditional mice.

U.S. Pat. No. 5,260,697 (Barrett, et al.) discloses a digitizing tablet overlaying a display screen. The system allows for the simulation of computer input devices such as a mouse and keyboard by a pen upon the digitizing touch tablet. The disclosed system provides for user operation of preexisting programs with a pointer-type device that the pre-existing programs were not designed to accommodate. This is accomplished by providing a separate user interface system consisting at least an interface processor that logically overlays, but does not interface with, the operation of the preexisting program. The interface processor is used to execute software that is needed to implementing the interface. In addition to that, the display buffer has to be modified to incorporate the data outputted by the interface that performs the data combination. That is, additional hardware and hardware modification to the existing personal computer are required to implement the system. In summary, in order to make use of the disclosed digitizing tablet system, the user must reconfigure his/her personal computer. This is not feasible if not impossible unless user has to replace his personal computer system with the specialized designed computer system for the purpose of using the disclosed digital tablet input device. In addition, the system proposed is essentially a digital tablet. When a user has little time to focus on the tablet and the device has to be used in not well lit environments, push a simulated button on such a small tablet is infeasible.

U.S. Pat. No. 6,219,037 (Lee) discloses a pointing device provided with two types of input means for a computer system, preferably a notebook (or portable) computer.

In a similar endeavor, U.S. Pat. No. 6,035,350 (Swamy, et al.) discloses a detachable I/O device with built-in RF/IR functionality to facilitate remote audio-visual presentations.

U.S. Pat. No. 6,392,637 (Liao, et al.) discloses a method to divide a computer touchpad into multiple regions (or using multiple touchpads as input devices). With some touchpads can be used as configurable buttons. Using touchpad to simulate button functions has the advantage of illuminate the traditional mechanical mouse buttons.

U.S. Pat. No. 5,355,148 (Anderson) discloses a fingerpoint mouse using photo-voltaic sensing cells rather than touchpads. By sensing the direction of the pressure applied by the figure using diode light, it translates the pressure into mouse movement. The fingerpoint mouse takes significant less space compared to a traditional touchpad. It is about the size of a trackball mouse button. In fact, it is similar to a trackball mouse. While the finger point mouse has a concave surface, a trackball has a convex surface design. Like a trackball mouse, the fingerpoint recommend, if handheld, is hard to operate ergonomically using one hand, if not impossible. To operate the disclosed finger point mouse using one hand, the base or housing should be held relatively steady, in addition, the finger that applies pressure to the mouse has to be flexible enough to move and rotate in all directions. This is apparently impractical. The finger mouse disclosed is thus not suitable to being a handheld mouse.

U.S. Pat. No. 5,327,161 (Logan, et al.) discloses a method to emulate mouse-input devices using a program resident within a computer system. A touchpad device has a controller generating a digital code that contains the absolute position of a pen or finger on the mouse pad. This also requires a special interface that is unique to the touchpad circuitry.

U.S. Pat. No. 5,376,946 (Mikan) describes a circuit using an EPROM to convert signals from a touch screen adhered to a computer display screen to digital codes of the industry standard computer input mouse protocols.

U.S. Pat. No. 5,543,591 (Gillespie, et al.) discloses methods for recognizing tapping, pushing, hopping and zigzagging gestures upon a conductive sensor pad that can be interpreted into cursor control motions such as clicking, double clicking, and click and drag use with computer mouse devices. Further this patent also describes the "edge motion" feature as described in U.S. Pat. No. 5,543,590 (Gillespie, et al.).

U.S. Pat. No. 5,543,588 (Bisset, et al.) discloses a device that is touchpad driven and handheld. A display screen is disposed on a first one of the major opposing aces of the enclosure and a touch -

sensitive object position detector input device is disposed on a second one of the major opposing faces of the enclosure. Special designed circuitry is also disclosed.

U.S. Pat. No. 5,995,084 (Chan, et al.) discloses a system and its methods for the detection of motions of a pointed object upon a writing surface such as a touchpad. The motion is then converted in a multiplexing analog-to-digital converter to digital codes representing the location of the pointed object and the pressures of the pointed object upon the touchpad. The system and methods, again, need a special driver circuitry and the information of the absolute locations of the pointer.

U.S. Pat. No. 5,990,890 (Etheredge, 1999) disclosed a system for data entry and navigation in a user interface. The method and apparatus for quick access to menu and selection items of a user interface using an input device having limited capability. Focused on a remote control to interact with on-screen symbols menus and submenus.

U. S. Pat. No. 5,189,403 disclosed a method regarding an integrated pointing device coupled to a pointing key. It specifically address the method that allow a computer user to type and to point without removing the hands from the home row of the keyboard, and without dramatically changing the physical activity.

The following is regarding to the invention of a better ergonomic mouse.

U. S. Pat. No. 6,005,553 provided an improved ergonomic computer mouse is provided. The ergonomic mouse allows for the operator's hand to remain in a relaxed position in as near a state of repose as possible while operating the mouse. The shape of the mouse reduces several of the known high-risk postures during mouse use.

SUMMARY OF THE INVENTION

An ergonomic handheld computer mouse with a holder using a hookup software that converts signals not unique to any traditional touchpad mouse is disclosed. The invention has all the functionality of both traditional mouse and keyboard. The handheld feature allows user to sit in a reposed position and alleviates the physical constraints placed on traditional keyboards and mice. This provides great comfort for the user when performing browsing and viewing intensive computer tasks such as browsing Internet.

Another object of this invention is a method of interpretation of regular mouse movements and recognizing them as handwritten keyboard inputs. This altogether alleviates any special circuitry required in all previously disclosed invention when the touchpad signals are used as keyboard simulation.

Furthermore, another object of this invention is to provide a mouse holder, if desired. When combined with the handheld unit, it allows simulating the regular touchpad mouse environment.

Still, another object of this invention is to detect the changing of input modes between the mouse input and the keyboard input using purely handwritten recognition instead of using a physical switch.

Further still, another object of this invention is to provide users the capability of customizing the handwritten recognition as a switch.

Last, another object of this invention is to recognize the sequence of handwritten strokes being part of the input signals to provide more accurate and efficient handwritten recognition.

BRIEF DESCRIPTION OF DARWINGS

FIG. 1 illustrates the ergonomic shapes of the elliptical mouse in top view. The shape does not have to be symmetrically in geometric sense. A small variation around the contours of the mouse may allow more conformability of the griping. The sizes illustrated in the drawing are for illustration purpose although it is close to the real size of the mouse.

FIG. 2 illustrates the ergonomic shapes of the elliptical mouse in side view. Again, the contour does not have to be symmetrically in geometric sense. A small variation around the contours of the mouse may allow more conformability of the griping.

FIG. 3 illustrates the ergonomic shapes of the elliptical mouse in bottom view. Again, the contour does not have to be symmetrically in geometric sense.

FIG. 4 is the signal flow block diagram of a computer system employing the handheld touchpad mouse.

FIG. 5 is the block diagram of the software for the computer system showing the scope of the hookup software disclosed in the invention.

FIG. 6 illustrates the signals flow between the mouse input mode and the keyboard input mode

FIG. 7 illustrates the signals flow between the mouse input mode and the keyboard input mode

DESCRIPTION OF PREFERED EMBODIMENT

A regular standard touchpad (200) is attached on the top of the said claimed handheld mouse body (Fig. 1 - Fig. 3). The mouse body is of the size slightly smaller than a user's palm so it can be hand held in a grasp grip position. With the four other fingers holding the mouse body in the grasp position, the thumb can make contract with the touchpad (200) in a natural position. The thumb can rest on the touchpad (200), stretch to make the mouse cursor move up, retract to make the mouse cursor move down and slide left/right to make the cursor move left/right.

The shape of the mouse body can be elliptic or credit card type. They should be fit comfortably into the user's palm. The size of the touchpad is smaller than the size of the housing hosting the mouse but should be large enough to allow some space for the thumb's movement.

Standard mouse buttons (201, 202, 203) are located in front of the touchpad and/or on the side of the touchpad. They should be easily and comfortably reachable/or rested upon by other fingers of the same hand of the user, which holds the mouse. Additional mouse buttons can be added to enhance functionality of the handheld mouse or provide shortcuts to software applications. But they are not necessary. Using the method disclosed in this invention, any mouse, existing or new, remotely connected or cable connected will be enabled to simulate the keyboard inputs.

Touchpad 200 is typically operated with a conductive device such as a stylus or finger. Touchpad 200 can be either a relative or an absolute cursor movement device used in microcomputer systems. The body of the mouse can be made of plastic materials. The mouse buttons (201, 202, and 203) can be made of the same type of materials as the mouse body.

The electronics and circuitry of generating mouse signals using touchpad are well known to any persons skilled in the art. The input signals are fed into computer either wired or remotely through standard mouse protocols such as Microsoft corporation's MS mouse standard, or International Business machines' Incorporated PS/2 mouse standard, or the Apple computer, Inc.'s Apple Desktop Bus or any other applicable computer input mouse protocol. The remote transmission of mouse signals through IR, RF and Blue Tooth technology. The nature of the transceivers of IR, RF and Blue Tooth Technology should be well known to those skilled in the art and is not the subject of this invention.

Touchpad signals are then picked up by the operating system 3, usually a windows based operating system such as Microsoft Window 9X. Since Window 9X is a very popular operating system, we will use it as our preferred embodiment.

We are now ready to illustrate with the preferred embodiment, how the handheld mouse with only standard mouse functions can be used to replace keyboard. In fact, any exiting traditional mouse, using the hook up software disclosed below, can be used to replace the keyboard function. See the reference "EightThreads, MouseWin Help".

A windows-based application receives mouse inputs and the inputs containing mouse position and the time of the position was recorded are then posted in the form of messages. They are sent and posted to the operating system 3. When a user moves the mouse, the operating system 3 moves a bitmap on the screen called the mouse cursor. The mouse cursor contains a single-pixel point called the hot spot, a point that the operating system 3 tracks and recognizes as the position of the cursor. When a mouse event occurs, the window that contains the hot spot typically receives the mouse message resulting from the event from the operating system 3. The window need not be active or have the keyboard focus to receive a mouse message. The examples of mouse events include mouse move signals, button clicked, or button double clicked signals. The nature of mouse events and the standard mouse messages are known to those skilled in the art.

A window application receives a mouse message when a mouse event occurs while the cursor is within the borders of the application window, called client area, or when the application window has captured the mouse.

Mouse messages are divided into two groups: client area messages and non-client area messages. Typically, a window application processes client area messages and ignores non-client area messages (other messages other than client area messages). A window receives a client area mouse message when a mouse event occurs within the window's client area. For example, the operating system 3 posts the WM_MOUSEMOVE message to the window when the user moves the cursor within the client area. Window also provides parameters when a mouse event occurs. These parameters include the position of the cursor hot spot, which is the x-coordinate of the hot spot and the y-coordinate. The coordinates are given in client coordinates. In the client coordinate system, all points on the screen are given relative to the coordinates (0, 0) of the upper left corner of the client area.

A window receives a non-client area mouse message when a mouse event occurs in any part of a window except the client area. A window's non-client area consists of its border, menu bar, title bar, scroll bar, System menu (also called the Control menu), Minimize button, and Maximize button. Windows generates non-client area messages primarily for its own use. For example, Windows uses non-client area messages to change the cursor to a two-headed arrow when the cursor hot spot moves into a window's border. A window must pass non-client area mouse messages to the DefWindowProc function to take advantage of the built-in mouse interface found in Windows.

Also there is a corresponding non-client area mouse message for each client area mouse message. The names of these messages are similar except that the named constants for the non-client area messages include the letters NC. For example, moving the cursor in the non-client area generates a WM_NCMOUSEMOVE message, and pressing the left mouse button while the cursor is in the non-client area generates a WM_NCLBUTTNDOWN message. The lParam parameter of a non-client area mouse message is a POINTS structure that contains the x- and y-coordinates of the cursor hot spot. Unlike coordinates of client area mouse messages, the coordinates are given in screen coordinates rather than client coordinates. In the screen coordinate system, all points on the screen are relative to the coordinates (0,0) of the upper left corner of the screen.

To summarize, the window applications are capable of receiving messages regarding all mouse events occurred.

The method disclosed uses a Microsoft window technology called Window Hook (see Steven Holzner 1997), specifically Mouse and Keyboard Hooks and Journal Hooks. Journal Hooks allow

the disclosed hookup software 4 read and playback the system inputs including keyboard and mouse movements. The hookup software 4 using the Journal Hooks can peek into all mouse events occurred and process them according to the mouse movements on the touchpad. The hookup software 4 comprises two major components, the handwritten mode detector 6 and handwritten character recognition component 8. The handwritten mode detector tracks all mouse movements direct to window applications to detect a mode switch maneuver. The mode switch maneuver can be any meaningful movement such as quick back and forth movements of the user's thumb on the touchpad. The mode switch maneuver can also be drawing of a circle, or point click on an area designated on the windows screen, as seen fit by the user. The user can customize the maneuver in the setting of the software. Once such maneuver or action is taken by the user on the touchpad 1, it deems to cause mode changes between the mouse input mode (7) and keyboard input mode (8). In the mouse input mode, all standard mouse inputs are recognized by window applications. The touchpad is acted as a regular touchpad mouse except that all mouse movements is tracked and watched by the hookup software's mode detector running in the background. The mode change detector tracks the user's thumb movements to detect if there is a mode switch maneuver. Once the mode change is detected, it will then switch to the input mode to simulate keyboard entries, all mouse movements thereafter are keyboard entries simulations until the next switch maneuver is detected. Note the switch maneuver from the mouse input mode to the keyboard input mode could be different when necessary. In keyboard input mode, all thumb movements will be interpreted as keystroke signals and sent to handwritten recognition package 10. The recognition software 10 then interprets thumb movement as keystrokes using recognition mechanism which constructs sequences of keystroke signals captured and compare them to the characters stored in a character banks. The handwritten software knows whether the current thumb stroke is the end stroke of a specific character by a embedded mechanism sequence recognition. Once it recognizes the stock is the end stroke of a specific character, it will then post a keyboard character entry messages to the operating system 4. The recognizable keys can include all key characters on the standard keyboard (alpha numeric, function keys). User can also map keys into different strokes for better and more efficient recognition performance. To facilitate the recognition process without absolute mouse location information, the cursor location is reset to the middle of the screen after each keystroke in the keyboard input mode. This avoids the situation when the cursor is outside the screen range. A bitmap illustrates the character recognized in progress can also be displayed when necessary.

Note that the software used to recognize handwritten (or thumb movements) as the keyboard entry signal does not form any part of the said claims. One of such recognition software is built using Intel Primitive Recognition Library.

Having illustrated and described the principles of the invention in a preferred embodiment thereof, it should be readily apparent to those skilled in the art that the invention can be modified in arrangement and detail without departing from such principles. In particular, but without limitation, allocation of functions between hardware and software is subject to wide variation depending on system platforms. We claim all modifications coming within the sprit and scope of the accompanying claims.